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Using Appreciative Inquiry to Empower International Students to Flourish in Research

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ABSTRACT

Despite growing studies on Appreciative Inquiry (AI), rooted in positive psychology, its application in a research laboratory and its associated impact on students' mental health and well-being are underexplored. Thus, this study explores how a positive environment affects students' mental health and well-being. Interpretive descriptions guided the data collection and analysis process. We conducted focus groups and interviews with 23 students recruited through convenience sampling. Reflexive thematic analysis identified three themes: (1) feeling valued by others builds confidence, (2) strength-based guidance fosters growth, and (3) meaningful research work increases resilience. Our study suggests that a positive environment informed by Appreciative Inquiry has the potential to positively affect the mental health and well-being of international students.

Keywords: Appreciative Inquiry, Positivity, International Students, Mental Health, Well-being, Research Lab

INTRODUCTION

The global population, including Canada, is aging (WHO, 2022). According to the government of Canada, the country will face significant population aging in the coming decades, which will profoundly impact society. By 2030, Canada is expected to become a "superaged" country, where one in five people will be over 65 (Statistics Canada, 2022). Concurrently, health worker shortages remain among the greatest challenges in the Canadian healthcare sector (Canadian Nurses Association, 2024).

In Canada, international students are considered "a significant and growing source of permanent immigrants" in response to the demographic shift (Stirrett, 2022, p.1). The expectation is built under the context of "designer immigrants" (Simmons, 1999), in which international students are trained to meet Canadian standards to address the supply and demand of the market after graduation and become temporary foreign workers recruited by Canadian employers (Crossman et al., 2020; Hawthorne, 2012). Compared with foreign-trained professionals, international students who contribute to the future workforce have the advantages of familiarity with local culture and language proficiency (Hawthorne, 2012; Lowe, 2008). Indeed, between 2010 and 2019, the number of international students enrolled in public postsecondary educational institutions in Canada grew rapidly, from 142,200 to 388,800 (Crossman et al., 2021).

However, only approximately three of the ten international students who arrived after 2000 became landed immigrants within ten years of their arrival (Choi et al., 2021). In other words, approximately 70% of international students do not contribute to the Canadian workforce, although their skills are acquired in Canadian educational institutions (Choi et al., 2021). Hence, it is essential to support students' mental health and well-being, including that of international students, to facilitate their successful transition into employment, potentially making high-quality contributions to healthcare, economic and other sectors.
Furthermore, studies have shown that the mental health of most international students has been negatively affected by the pandemic (Firang & Mensah, 2022). Although the literature has indicated the importance of supporting students' mental health and well-being before the pandemic (Clarke, 2023; Evans et al., 2018; Levecque et al., 2017; Wyatt & Oswalt, 2013), the topic has become crucial in its aftermath. Disrupted education systems adversely impact students' mental health, leading to increased reports of depression, anxiety, and other psychological challenges. The shift to online learning has exacerbated feelings of isolation and disconnection among students, affecting their ability to engage with peers and acquire essential professional skills (Azmi et al., 2022).

The challenges brought forth by the pandemic have underscored the importance of peer support, coaching, and mentorship within an academic environment to foster student well-being. In a study by Wu and Liu (2023), students reported experiencing social isolation and a loss of connection with peers due to the shift to online learning. In addition, university students are expected to learn and deliver research output in a fast-paced environment. Oswalt and Riddock (2007) reported that 75% of graduate students feel stressed. In the study

by Hyun et al. (2006), 50% of their students reported feeling overwhelmed, and 40% reported being exhausted. The global pandemic has resulted in additional stressors and induced posttraumatic stress disorder (PTSD), depressive symptoms, and other psychological and physical symptoms in the student population (Tang et al., 2020). A study by SenthilKumar et al. (2023) described how the pace of scientific competitive culture and the lack of sufficient support for students from diverse backgrounds influence students' mental well-being, especially for international students.

Traditionally, studies (list some here such as xx xxx and xxx) on student mental health and well-being have investigated the presence or absence of mental health conditions such as depression, anxiety, and burnout. In the literature, well-being has often been reduced to a concept that indicates the absence of mental health symptoms, such as anxiety and depression (Lin et al., 2016). Little attention has been given to positive aspects of mental health, such as happiness, confidence, safety, a sense of belonging, growth, and the motivation to perform. Furthermore, the environmental and cultural drivers of these positive indicators of mental health remain underexplored. For example, there are many unwritten stories about what is valued in research, what makes an international student resilient, and what helps a female immigrant student cope with adversity and maintain positivity to flourish in academic success. Making those unwritten stories visible will help improve the research culture for everyone involved.

There is much complexity in the two concepts of mental health and well-being. While closely related, these concepts are unique and independent (Dodd et al., 2021). There are two broad approaches to well-being in the contemporary psychology literature: hedonic and eudaimonic well-being (Ryan & Deci, 2001). Hedonic approaches often focus on subjective well-being and emphasize constructs such as happiness and affect. Moreover, eudaimonic approaches place greater emphasis on self-actualization and meaning. Those taking a eudaimonic approach also understand that well-being extends beyond subjective appraisals of happiness or life satisfaction (Ryff, 1989)and instead consists of an ongoing process of fostering fulfillment and achieving potential (Deci & Ryan, 2008).
The motivation aspect of self-determination theory (SDT) is also intertwined with the concept of the eudemonic approach; SDT emphasizes personal competence, relatedness, and autonomy. Pursuing intrinsic goals, embracing personal values, maintaining awareness, and behaving autonomously are vital to positively affect psychological, mental, and physical wellness (Ryan et al., 2013). In a study by López-Santacruz and Guízar-Mendoza (2022), students reported a desire to pursue meaningful career paths that enable them to help others and make a positive impact. A sense of purpose was deemed a driver and a source of psychological well-being.

Amidst these unprecedented educational disruptions, the Innovation in DEmentia and Aging (IDEA) Lab was established in 2020 to focus on technology in aging research (IDEA Lab, 2024). This field aims to contribute to society by supporting innovative care for older adults. The research lab provided a platform for students to connect and overcome their sense of isolation, and it aligned with

the intrinsic motivation of many students with aspirations to pursue meaningful careers that have a societal impact.

THE IDEA LAB AND APPRECIATIVE INQUIRY

The IDEA Lab was developed by Professor Lillian Hung at the School of Nursing at a Canadian university, to bring students from multiple disciplines together to conduct technology implementation research to improve care for older adults. The lab comprises more than 100 students with diverse backgrounds. In terms of academic training, students ranged from undergraduate to master's and PhD levels. Among these students, more than 80% were visible minorities and females who are traditionally underrepresented in scientific research. The majority of them are international health-related students. This paper refers to international students as those who came from outside Canada to pursue education.

In this lab, students work closely with patient partners (older adults), healthcare organizations, and local community members on projects to innovate care for older adults. The practices in the lab are aligned with practical strategies suggested in the literature to promote an inclusive and supportive training environment (Chaudhary & Berhe, 2020). The IDEA lab has two primary aims:

1) To engage students in multidisciplinary research to increase their knowledge and skills in applied gerontology.
2) To provide a platform for students to research with older adults for social impact.

The students are given options, support, and guidance to take on different roles on the basis of their interests, capacities, and professional goals. For example, students lead projects, collect data, analyze data, present at conferences, write manuscripts and design knowledge translation outputs. Some students were hired as research assistants, whereas others contributed as volunteers. All the students received ongoing support and guidance from the Principal Investigator (PI)/the head of the lab. The projects included implementing virtual reality programs, social robots and other service robots in local hospitals and long-term care homes.

The lab developed its learning culture and environment on the basis of the principles of Appreciative Inquiry (AI) (Cooperrider & Whitney, 2000). Appreciative inquiry has been recognized as an effective approach to organizational development (Bushe, 2013; Cooperrider & Whitney, 2000). However, few studies have reported how AI can be applied in academic research settings. This study examines how a gerontology research lab guided by Appreciative Inquiry influences students' mental health and well-being.

AI was chosen to guide the lab's culture and practice because its core principles—positive collaboration and reflexive practice—align with the lab members' shared desires to foster growth through a strength-based approach. A recent study in the Netherlands demonstrated how AI successfully fostered students' motivation to cocreate with older adults, improving age-friendly services (van den Berg et al., 2019).

AI philosophy takes a positive approach to support human flourishing (Reed, 2006). In a previous geriatric study, AI motivated clinicians to build collective intelligence and team capacity (Hung et al., 2016). AI may empower students to become a positive workforce for the future care of older people. AI focuses on asking generative questions, such as by bringing people together to generate positive energy to address problems (Reed, 2006).

METHOD

Design

Given the complex nature of student experiences, this study employs a qualitative approach to understand how students' experiences in the research laboratory affect their mental health and well-being. Interpretive description (ID) methodology guided the data collection and analysis (Thorne, 2016). ID is suitable for this study because interpretivism values the meaning that participants construct from their subjective experiences. ID is particularly helpful in generating practical knowledge for training the next generation in healthcare to improve senior care. We report the study results following the Consolidated Criteria for Reporting Qualitative Research (COREQ) Checklist (Tong et al., 2007). See Appendix 1 for the COREQ Checklist.

Ethical considerations

We applied several strategies to ensure rigor and address potential bias. First, we have embedded regular team reflection sessions to identify and address ethical issues and biases. All the authors are encouraged to openly discuss their perspectives, concerns, and observations about the research process during these sessions. This collective dialog helps to surface any unconscious biases, ethical dilemmas, or power dynamics that might influence the research. Second, we kept detailed documentation of our research processes, decisions, and challenges encountered to enhance transparency. Third, our research team includes diverse perspectives that help mitigate the risk of bias through robust discussions and a broader understanding of the ethical implications of the research. The University Research Ethics Board approved this study (REB#H22-02402).

Data collection

We developed the interview guide and pilot tested it with a few trainees, who considered the questions understandable, given the participants' educational backgrounds. We then reviewed the interview guide and facilitated two focus groups and six follow-up individual interviews with seven undergraduate and 16 graduate students. All focus groups and interviews were conducted in English. See Table 1 for a timeline of the data collection activities.

Table 1: Data collection activities

Month and Year	Type of Data Collection
August, 2023	Focus Group 1
August, 2023	Focus Group 2
December, 2023	One-to-one interviews

Participants were recruited through convenience sampling from a group email sent to all trainees in the lab, with the goals and reasons for the research project explained. Trainees who expressed interest were invited to participate in the focus group at a mutually convenient time. SC explained the interview questions to all participants who came to the session. With participants' consent, SC conducted and video-recorded all focus groups and interviews over a virtual conferencing platform—zoom meetings. Two focus groups were conducted in August 2023, each lasting an hour. Following the initial data analysis, SC conducted follow-up interviews. All participants in the focus groups were invited to participate in a 30-- to 45-minute follow-up interview. Six participants attended the follow-up interviews in December 2023. SC took field notes for all focus groups and interviews. The BC is a female Asian family partner (a family caregiver of a person living with dementia) of the IDEA Lab. To ensure a safe environment and address power dynamics, the LH, the PI and the founder of the IDEA Lab did not participate in any focus group or interview sessions. Instead, she invited SC, a male psychology professor external to the lab, to collect the data.

The focus group discussions and semistructured interviews included the following topics: experience in the lab, perceptions of the strength-based approach, lab culture, challenges, suggestions for improving the lab, general comments for the supervisor, peer relationships, and experiences working with patient partners. SC, a psychologist and external expert, led the data collection to enhance the study's credibility in two ways. First, he developed specialized skills in qualitative research methodologies, ensuring rigorous research practices. Second, participants felt more comfortable discussing sensitive topics with someone outside their usual academic environment, leading to more open and honest responses. The data were automatically transcribed by Zoom, reorganized by LRs and other trainees from the laboratory, and checked by the SC. Data collection ceased when the team agreed that the data collected were sufficient to address the research question.

Data analysis

Our data analysis aimed to capture individual perceptions and the overall team experience—where commonalities and differences exist. The study focuses on finding answers to the following research question: How does a research lab environment affect students' mental health and well-being? Our analysis was guided by six steps of thematic analysis (Braun & Clarke, 2022) and the six phases introduced by Nowell et al. (2017). In Step 1, all the authors were involved in reading and rereading the transcripts, coding and analyzing them inductively and deductively. LR is a female Asian PhD international student in interdisciplinary studies. HI is a female Asian master's student in public health. LR and HI are

trainees supervised by LH. In Step 2, LR sorted the data and performed the initial analysis manually. In Step 3, we discussed the data as a team and developed preliminary themes. The team refined the themes together in Step 4. In Step 5, the team conducted further data analysis and discussion on themes and collectively agreed on the quotations selected together for the paper. Finally, in Step 6, LH wrote the first draft of the manuscript. All the authors edited, reviewed and reached a consensus on the final manuscript.

Ethical considerations

We applied several strategies to ensure rigour and address potential bias. First, regular team reflection sessions were held to identify and address ethical issues and biases. During these sessions, all team members were encouraged to openly discuss their perspectives, concerns, and observations about the research process. This collective dialog helped to surface any unconscious biases, ethical dilemmas, or power dynamics that might influence the research. Second, we kept detailed documentation of our research processes, decisions, and challenges encountered to enhance transparency. Third, our research team included diverse perspectives that helped mitigate the risk of bias and broadened our understanding of the ethical implications of the research.

RESULTS

A total of 23 students participated in the study. The student participants came from diverse professional and cultural backgrounds, reflecting their overall demographics. Almost half of the participants were from health-related fields, including nursing, medicine, and public health. Participants from nonhealth-related professions, such as industry, economics, and international relations, were also included. A total of 91.3% of the participants were female. The participants at all educational levels (undergraduate, graduate and PhD) were represented, with graduate students accounting for the largest portion (43.38%) of the participants.

All participants (100%) were visible minorities, comprising mostly East Asian (69.57%) and South Asian (21.74%) minorities. A total of 4.35% of the students were from African or Persian backgrounds. See Table 2 for their characteristics.

Reflexive thematic analysis identified three themes: (1) Feeling valued by others builds confidence, (2) strength-based guidance fosters growth, and (3) meaningful research work increases resilience. Table 3 shows examples of how the students' quotes were clustered into codes, categories, and final themes.

Table 2: Demographic *characteristics of the participants (n = 23)*

Student Characteristics	N	%
Main Discipline		
Nursing	11	47.83%
Medicine	4	17.39%
Public Health	2	8.70%
Science	1	4.35%
Industry	1	4.35%
International Relations	1	4.35%
Economics	1	4.35%
Kinesiology	1	4.35%
Biology	1	4.35%
Gender		0.00%
Female	21	91.30%
Male	2	8.70%
Levels of Education		
Undergraduate	7	30.43%
Master	10	43.48%
PhD	6	26.09%
Racial background		
East Asian	16	69.57%
South Asian	5	21.74%
African	1	4.35%
Persian	1	4.35%
Total	23	100%

Theme 1: Feeling valued by others builds confidence

In academic institutions, students navigate a highly demanding and competitive environment that often strains their mental health and self-perception. Our findings suggest that the relational dimensions within the lab and a shared commitment to community contribution have a beneficial impact on their well-being. The participants consistently reported that the peer support, positive reinforcement, and acknowledgment they received bolstered their self-confidence and promoted a positive self-image. This was further evidenced by the

participants' sense of fulfillment derived from engaging in work they viewed as beneficial to society, imbuing them with a meaningful sense of purpose.

Table 3: Example of Quotes for Theme Development

Theme	Categories	Code	Quotes
Feeling valued by others builds confidence	Social Support	Friendship	*"The social aspect is that I have met so many people through the years, and some have become close friends."*
Strength-based guidance fosters growth	Positivity	Acknowledgment of strengths	*"The professor told the team about my strengths in facilitation, which made me feel included and as if I was a valuable team member."*
Meaningful research work boosts resilience	Re-energized	Reconnect passion	*I was involved in implementing a research project and was privileged to do it at my workplace. At the time, I was feeling burned out and not wanting to go to work. In addition, so just having a research project to implement was refreshing, something new. I got reconnected to the other staff, and my passion was reenergized.*

One student, who described themselves as naturally people-oriented and enthusiastic about research, noted a significant improvement in well-being after working with the lab.

> "I am a people person, passionate about academic research. Before joining the IDEA Lab, I never thought I could facilitate academic meetings or engage with older adults with dementia. It is been especially important to me during the pandemic, as I have been socially isolated. Being back in the community and working with great people has improved my well-being."
> - An international PhD student

Another student expressed how acknowledgment within the lab eased the stress associated with uncertainty about their academic and career choices. This recognition translated into a heightened sense of confidence.

> "My stress level was high in terms of mental health. I often stress where I am headed in life, especially in regard to my studies and career. It is tough to know if I'm making the right choices. However, getting recognition for my work truly helps ease that anxiety. Knowing that others appreciate what I do gives me a boost of confidence."
> -An international master's student

The lab's inclusive, nonhierarchical structure was perceived as a key factor in fostering a sense of belonging among its members. This approach allowed for autonomy in task selection and equitable participation, cultivating personal growth and skill enhancement at the students' pace. Likewise, the supportive environment encouraged mentorship, enhancing leadership and teamwork skills.

> "The nonhierarchical structure allows members to choose tasks on the basis of interest and ensures inclusion and equity among members. Projects and types of tasks are open to everyone, fostering personal development of your will. Members are welcome to contribute in their own way with flexible support. Experienced members mentor new ones, which also strengthens leadership skills." -An international master's student

Students frequently described the lab as a place of discovery, where encouragement to try new things led to self-realization and skill development. Within this nurturing setting, students felt empowered to explore unfamiliar territories, enhancing their capacity to succeed without fear of failure.

> "The support and encouragement made me feel like I belonged. Involvement in writing workshops and manuscript reviews improved my skills and made me feel happy."
> -An international master's student

Another trainee added:

> "I feel encouraged to try. It is a discovery process that helps me realize my potential and develop new skills. In this environment, you are more likely to discover completely new areas and have the courage to take on and see how much you can accomplish instead of being scared of making mistakes."
> -An international master's student

The most salient theme identified was the importance of relationships in supporting student mental health. Positive emotional experiences such as joy, excitement, and satisfaction are linked to enhanced well-being. The social

relationships with peers, the PI, patients and family partners provided foundational support for students' psychological health, offering both safety and compassion. For instance, a participant stated,

> "Regarding social aspects, I have met many people through the lab, and some have become close friends. Yeah, it was socialization and a sense of achievement, I think. It helped a lot."
> -An international undergraduate student

Theme 2: Strength-based guidance fosters growth

Teamwork and personal growth were considered pivotal aspects of the academic journey for students at all levels within the lab. The students expressed a profound sense of accomplishment and contentment stemming from the responsibility of project ownership and the reciprocal trust within the team. This feeling of validation and recognition was highlighted as essential to their sense of belonging and value within the group. This is particularly important for international students:

> "As an international student, joining the lab was nerve-wracking initially, but everyone was kind and patient. My confidence grew as I contributed my skills. Working on projects such as filming videos for the Virtual Reality program brought me happiness."
> - An international undergraduate student

> "Joining the lab as a newcomer to Vancouver was comforting. The friendly atmosphere and engagement with innovative projects such as robots made me feel included."
> - An international master's student

> "The collegial feeling of working together was a highlight for me; teamwork made research less intimidating."
> - An international master's student

International students' transition was supported by the welcoming atmosphere and the exciting opportunity to engage with innovative projects, such as robotics. The sense of collegiality was particularly noted for its role in demystifying the research process and integrating new members into the team. Students repeatedly mentioned that participation in research activities, such as knowledge translation, increased confidence. Acknowledging achievements and constructive feedback from team members bolstered team experience and individual well-being. For example, a student expressed the following:

> "My experience with the Telerobot project allowed me to use my strength in creativity and knowledge translation. The lab encouraged me to

> improve as a leader. Writing the Monthly Telerobot Newsletter allowed me to receive feedback and improve as a leader, using appropriate language that resonates with participants and families. I feel empowered by the trust placed in me by the team. Leading tasks such as knowledge translation have reinforced my strengths."
> - An international undergraduate student

The participants also allude to the importance of mentorship and guidance:

> "The professor's awareness of everyone's contributions in the lab and her encouragement have been significant. Her positive approach and support contributed to a supportive and uplifting atmosphere. Her feedback was valuable to me. - An international master's student
> I see the difference between training, coaching, mentoring, and delegating. The lab gave me opportunities to grow. In the lab, my opinion was respected. It makes me think the lab is my home."
> - An international master's student

The professor's recognition of each student's contributions and her consistent encouragement and guidance cultivated a nurturing environment that resonated as a home for some students.

For some students, the lab experience reaffirmed their strengths in project work. It helped them be successfully hired into a job they desired in healthcare, such as the director of long-term care and quality improvement leaders in health authorities.

Empower came from trust, as taking responsibility for a research task reinforced each student's strengths. Positive feedback not only bolstered inclusion but also positively impacted mental health.

> "In a meeting, the professor told the team about my strengths in facilitation, which made me feel included and as if I was a valuable team member. Therefore, it just had a positive overall impact on my mental health as part of this group. She suggested that I get involved in specific ways where my strengths might come into play."
> - An international undergraduate student

Some students found that their work in the lab resonated deeply with their aspirations. A few students spoke about how being in a learning environment that supports their career paths and purpose in life connected them to their personal goals by illuminating their understanding of self.

Additionally, the students expressed a sense of optimism in their ability to achieve their goals due to the confidence built from their work in research. This

positive experience was a helpful reminder when challenges and setbacks were encountered.

Theme 3: Meaningful research boosts resilience

The student responses highlighted the necessity of flexibility in adapting to the diverse needs of students. The students discussed the role of autonomy in their work. For example, a student said,

> "They created a sanctuary for many of us, most especially for those international students who are feeling lonely here, feeling that they're able to engage in the opportunity to be in a group that is accepting and welcoming; as mentioned earlier, the value of humility, too, from her end to extend her expertise to us and allow us to exchange our knowledge and skills and can develop our capabilities as individuals toward one goal which is very inspiring and motivating from on my end."
> - An international undergraduate student

Autonomy and personalized recognition within the lab are crucial for increasing students' mental health. One student reflected on how acknowledgment of their geriatric expertise during a meeting significantly boosted their morale, reinforcing the value of shared experiences and expertise.

This environment of flexibility and inclusiveness is essential. The students highlighted that they exceeded expectations when provided with opportunities to work creatively and flexibly, producing quality outcomes. This sense of agency and trust in their abilities is pivotal for motivation and personal growth. For example, one student explained, "One thing I will add is that with flexibility and inclusiveness. I get to be creative and want to do a good job and produce a quality outcome."

The students appreciated the flexibility that allowed them to contribute meaningfully to research and the world from their own spaces. This continued involvement imparted a sense of purpose and connection, significantly mitigating feelings of isolation. For one student, work in the lab meant the following:

> "I had to work remotely, and I appreciate the flexibility. I want to do it again after being asked to make a few videos. In addition, like the feedback I received, I felt valued and seen, and it gave me more motivation to learn and improve."
> - An international undergraduate student

The lab offered a silver lining for those who faced challenges during the pandemic. The recognition and validation of their work within the lab provided a sense of achievement and success when other aspects of life were struggling, thus having a profound impact on their mental health.

> "The lab has done a lot for mental health. I remember that after March 2020, we were all online, and the lab was the only connection I had to school. I was able to contribute to the research by helping with the interviews. I felt like I was able to contribute something to the world. Whenever I was feeling down during the pandemic, a little bit failing at something, I could think about my work at the lab. I know I can do an interview on how to make a conference presentation. My strengths were being used to help others. I thought about my successes in the lab when other places in my life may have been a bit challenging for me."
> - An international undergraduate student

Furthermore, engaging in lab projects offered a refreshing respite from the demands of academic and professional life. One student shared how leading a research project at their workplace reignited their passion and purpose, transforming the mundane into something fulfilling.

> "I can share a little about how it is helped me feel purposeful when implementing. I was involved in implementing a research project and was privileged to do it at my workplace. At the time, I was feeling burned out and not wanting to go to work. In addition, so just having a research project to implement was refreshing, something new. I got reconnected to the other staff, and my passion was reenergized."
> - An international undergraduate student

The outreach in the community, such as interactions with older adults in long-term care homes, enabled students to witness the tangible impact of their work, enhancing their sense of fulfillment and reward.

Moreover, the sense of community within the lab was beneficial during pervasive isolation. The lab fosters connections among students, patient partners, and family partners, creating a unique and supportive community.

> "I felt this way, particularly in grad school, but grad school can be isolating. Many of the things you do are on your own, and I'm sure you know with COVID as well, like I can imagine, whether you're in your undergrad or grad school or working. Like there was a lot of isolation. Therefore, I think a sense of community is fostered with the lab, student members, patient partners, and family partners. The feeling of being a part of a community is something that I think is special about this lab and something I appreciate."
> - An international undergraduate student

Mentorship and guidance from graduate students have been invaluable in alleviating anxieties about the uncertainties of academic life for undergraduate students. The students reported that working together helped them keep each other motivated and inspired, affirming the importance of collective support.

Finally, some discussed the need for financial support, particularly when balancing family obligations and educational expenses. Some students had to work a summer job to pay tuition, causing stress from the competitive demand for time to devote to the research work.

DISCUSSION AND IMPLICATION

This study aimed to understand students' perceptions and experiences regarding their mental health and well-being on the basis of their work and study in an academic lab where operations are informed by AI. Overall, the findings of this study emphasize the role that relationships, teamwork, and flexible support play in the well-being of students, including international students. The students' opportunities for learning and interactions with their team members, peers, and patient partners played a significant role in their mental health and well-being. Our findings corroborate the literature from research-intensive Canadian universities. For example, to improve international students' experiences, Tavares (2024) called for institution-led initiatives to include students through socialization with peers and foster an environment with enhanced equity, diversity, and inclusion, regardless of their identity as international students (Tavares, 2024). Similarly, Lane et al. (2018) reported that teaching practices adopting AI could positively influence students' well-being by increasing their feelings of being connected to their peers and motivated to learn (Lane et al., 2018).

Furthermore, the culture and environment of the research lab, guided by AI principles, supported the students' achievements, growth, and productivity. AI can be a helpful approach to fostering a positive and supportive culture in the lab where students are encouraged to succeed and their international academic, professional, and personal experiences are valued. The findings of our study are congruent with those of a study by Zhang et al. (2022), who reported that the most significant predictors of positive mental health and well-being among graduate students are feelings of satisfaction with their experience in the academic setting, a sense of belonging within them, and satisfaction with their educational supervisor. The study results can inform educators and institutions when designing and implementing well-being support interventions. This knowledge is timely and important.

Notably, the students in the study were from diverse disciplines and levels and various ethnic and racial backgrounds. They each have their own unique needs and strengths. Instead of a one-size-fits-all approach, flexible and tailored strategies are crucial in promoting students' well-being. To foster an inclusive earning environment for international students, future work should investigate student-led programs that cater to underrepresented groups' unique needs. Funding should be invested in student support groups to host events and get-togethers to improve the social connection between international students and students at various levels (SenthilKumar et al., 2023).

Our findings resonate with Ryff's six-factor model of psychological well-being (Ryff, 2014). The use of AI in the research laboratory could foster and facilitate the development of critical components of psychological well-being, including autonomy, environmental mastery, personal growth, positive relationships with others, purpose in life, and self-acceptance. All these values are central to eudaimonic well-being, which goes beyond mere pleasure and emphasizes living with meaning and virtue. The AI approach in the lab allows students to align their actions with their core beliefs and virtues. It enables them to pursue activities that contribute to their personal growth and achievements. This study addresses a critical empirical gap in the literature and informs future strategies for improving student support in academic training.

From the motivational lens, according to self-determination theory (Deci & Ryan, 2012), humans have three basic psychological needs that facilitate their well-being: competence, relatedness, and autonomy. Our findings also suggest that the AI approach taken in the laboratory promotes all these needs. Students claimed that they could master tasks in the flourishing environment, engage in meaningful social interactions with different people in different roles, develop self-directed goals, and make their own decisions. Self-determination can further influence mental health by reinforcing adaptive coping, resilience, and hope. These are valuable resources for students to mitigate symptoms of depression and anxiety (Perlman et al., 2018). For example, Chan and Huang (2022) examined the mediating role of hope in the association between negative emotions and depressive symptoms in university students and reported that hope-related pathways can be a protective factor in terms of university students' psychological outcomes.

University students are expected to play a significant role in supporting the demographic shift of the aging population in Canada. These students could become future taxpayers, formal and informal caregivers, and parents for the next generation. The study results raise awareness of the need to pay more attention to students from a variety of underrepresented backgrounds; more efforts should be made to help them build a sense of belonging and confidence.

Since the COVID-19 pandemic, student training in research has evolved and placed greater reliance on the online environment. Researchers and educators must have a comprehensive understanding of the difficulties and threats that students experience in modern learning environments. This understanding is particularly relevant for junior and undergraduate students, who are more vulnerable and may need more support in the early stages of their training. The need to support junior Chinese students may be particularly relevant for international students, who have been reported to receive mental health-related support relative to their domestic peers despite facing similar levels of stress (Clarke, 2023). Hence, future research should pay attention to the mental health of all university students, particularly international students. Similarly, future research should investigate factors that enable a culture and environment for research, study, and life that nurtures students' personal and professional development within the local context. Future studies are also recommended to

explore the implementation of a nurturing environment with an approach of equity, diversity, inclusiveness and accessibility.

STRENGTHS AND LIMITATIONS

Strengths

This study contributes useful insights into the needs of students who identify as international, female, and underrepresented minority populations. One strength of this study is that AI is a promising approach that can bridge the gaps in nurturing the growth of international students and meet the needs of stressful higher education environments. We offer a practical set of strategies—GROW, as shown below—which can be employed heuristically to support others and promote inclusive student support.

Practical tips/strategies

On the basis of our study results and insights from the literature, we created the acronym "GROW" to represent practical tips/strategies for cultivating a positive environment that supports student mental health and well-being in a research lab.

GROW: Practical Tips for Fostering Student Well-Being

G: **Give Recognition Promotion**

We acknowledge and value each student's contributions, helping to build confidence. Recognition makes students feel appreciated and encourages further engagement and participation in the lab.

R: **Relying on strength-based guidance**

Guide students by focusing on their strengths, offering mentorship and guidance that helps them grow. Instead of focusing on weaknesses, students should be encouraged to build on their skills and abilities to foster personal and professional development.

O: **Offer meaningful work opportunities**

Provide students with opportunities to engage in meaningful projects that contribute to real-world impact. Meaningful work increases motivation and resilience, allowing students to persevere even during challenging periods.

W: **Well-Being as a Priority**

> Making well-being a core value of the lab environment. Students should have access to support systems, open communication, and resources to manage their research responsibilities and mental health.

This acronym, **GROW**, serves as a quick and practical reminder of key actions to create a supportive, thriving research lab environment.

Limitations

This study has several limitations. First, the participants were primarily from social science backgrounds, which may not accurately represent the experiences of students from other fields, such as the natural sciences, business, or law. Second, the participants were drawn from a large, urban, and publicly funded university, potentially limiting the transferability of the findings to students at other universities in smaller, remote communities. Finally, none of the participants reported having physical disabilities, which means that the study may not capture the experiences and challenges faced by students with physical disabilities. These factors should be considered when interpreting the results and their applicability to broader student populations.

CONCLUSION

Appreciative inquiry (AI) can enhance the research laboratory environment to support students' mental health and well-being by cultivating a positive atmosphere. The positive research lab environment where each student's contributions are recognized and valued fosters a sense of confidence. The positive approach supports personal and professional growth, as students are guided to build on their talents to expand their research skills. Finally, engaging in research that students find meaningful and impactful reinforces their resilience.

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In the preparation of this manuscript, we did not utilize artificial intelligence (AI) tools for content creation.

Appendix 1: Consolidated criteria for reporting qualitative studies (COREQ) Checklist by Tong et al. (2007)

No.	Item	Guide questions/description	Answers
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	SC, LR and BC
2.	Credentials	What were the researcher's credentials? *E.g. PhD, MD*	PhD and masters
3.	Occupation	What was their occupation at the time of the study?	Professors, PhD student, Master's student and family partner
4.	Gender	Was the researcher male or female?	Four female and one male
5.	Experience and training	What experience or training did the researcher have?	Nursing, psychology, interdisciplinary studies and public health
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	Yes
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? e.*g. personal goals, reasons for doing the research*	Goals and reasons for doing the research
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. *Bias, assumptions, reasons and interests in the research topic*	Bias, assumptions and power dynamics were reflected and discussed in writing meetings
Domain 2: Study design			
Theoretical framework			
9.	Methodological orientation and Theory	What methodological orientation was stated to	Appreciative Inquiry

		underpin the study? *e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis*	
Participant selection			
10.	Sampling	How were participants selected? *e.g. purposive, convenience, consecutive, snowball*	Convenience sampling
11.	Method of approach	How were participants approached? e.*g. face-to-face, telephone, mail, email*	Online meeting
12.	Sample size	How many participants were in the study?	23
13.	Nonparticipation	How many people refused to participate or dropped out? Reasons?	No drop off. Lab members who did not participate were due to other commitments at the time of data collection
Setting			
14.	Setting of data collection	Where was the data collected? e.*g. home, clinic, workplace*	Places at researchers' and participants' convenience
15.	Presence of nonparticipants	Was anyone else present besides the participants and researchers?	No
16.	Description of sample	What are the important characteristics of the sample? *e.g. demographic data, date*	See Table 1 and 2
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	No interview questions provided. The interview guide has been pilot tested.
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No repeat interviews were carried out. The six interviews were

			conducted for six different participants.
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Data collection conducted online were recorded.
20.	Field notes	Were field notes made during and/or after the interview or focus group?	SC made field notes for all focus groups and interviews.
21.	Duration	What was the duration of the interviews or focus group?	30 to 45 minutes.
22.	Data saturation	Was data saturation discussed?	Yes.
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No. We did not return transcript to participants for comment and/or correction due to their heavy school commitments after data collection
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	One.
25.	Description of the coding tree	Did authors provide a description of the coding tree?	Yes. See Table 3.
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Derived from data.
27.	Software	What software, if applicable, was used to manage the data?	No software was used. Data were analyzed manually.
28.	Participant checking	Did participants provide feedback on the findings?	We did not involve participants to provide feedback on findings due to their heavy school commitments after data collection.

Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.*g. participant number*	Yes, we presented quotations to illustrate the themes. Each quotation was identified by adding the participant's education.
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	We made our best effort to ensure consistency between the data presented and the findings
31.	Clarity of major themes	Were major themes clearly presented in the findings?	We made our best effort to clearly present major themes in the findings.
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	We made our best effort to clearly describe diversity in participants' cases

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